User Recommendations for RF-Safe Green DET™

2-300750-1

MAN-DET-RF (R03)

OWEN OIL TOOLS

12001 Cr 1000
Godley, Texas, 76044, USA
Phone: +1 (817) 551-0540
Fax: +1 (817) 551-1674
www.corelab.com/owen

Warning: use of owen equipment contrary to manufacturer's specifications or operating instructions may result in property damage, serious injury or fatality. If you are not trained in the handling and use of explosive devices, do not attempt to use or assemble any owen perforating systems or owen firing devices.

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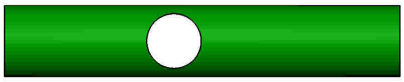
Warning: ***Explosives are destructive by nature! Do not attempt to disassemble or alter the detonator in any manner! Do not crush, hammer, pinch, impact, pull wires or abuse the detonator or any explosive!***

Warning: ***Be sure to follow safe operating practices as found in API RP-67 in accordance with governmental regulations, company policies and manufacturer's recommendations!***

Owen Oil Tool's and Pacific Scientific's RF-Safe Reactive Semi-Conductor Bridge (RSCB) Detonators are designed to detonate a lead free energetic material when an electrical voltage greater than 55 volts is applied. This allows the detonator to be fired with any standard 300V / 2A firing panel in wireline operations. The RF-Safe RSCB Detonator is manufactured to API RP-67 recommendations and has been tested and verified by Franklin Applied Physics to withstand up to 10 GHz frequency at 100 V/m field strength. This detonator will withstand temperatures of -40°F to 400°F for 12 hrs while still maintaining a 99.99% initiation reliability @ 95% confidence. For more technical information regarding this detonator, please refer to Owen Oil Tool's "Technical Specifications" sheet (Owen Document #2-300750-1-DS)

Green DET™ with Crimp Sleeve Accessory (DET-0010-074):



When used with the green "crimp sleeve" accessory (P/N DET-0010-074), the Green DET™ is designed to be used in hollow steel carrier or scalloped gun systems where a fluid disabled detonator will prevent the detonation of a flooded gun when used properly. Fluid migrating through the fluid holes in the body of the crimp sleeve will prevent the detonator from initiating the detonating cord. The detonator and crimp sleeve accessory is designed to be used with the following detonating cords:

- 80gr./ft. PETN*
- 80gr./ft. HMX
- 80gr./ft. HMX LS
- 80gr./ft. RDX
- 80gr./ft. RDX LS
- 40gr./ft. HMX LS
- 40gr./ft. HMX LS Ribbon
- 40gr./ft. RDX LS
- 40gr./ft. RDX LS Ribbon

*Not fluid disabled or interruptible w/PETN detonating cord.

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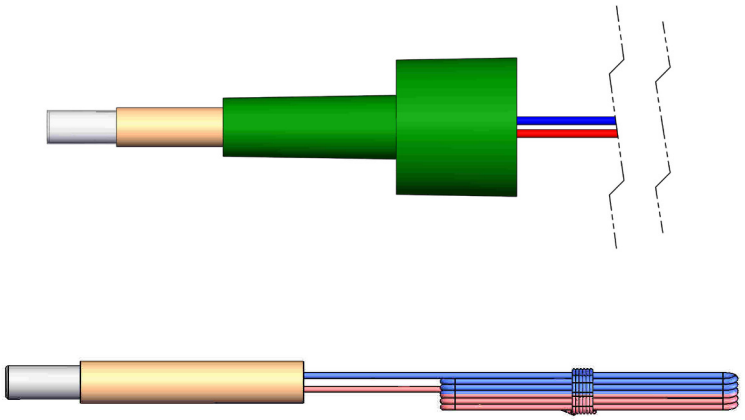
Note: *Detcord adapters must be used with 40 gr./ft. Ribbon detonating cord. Sold separately and packaged individually by Owen Oil Tools. P/N DET-0010-006.*

Note: *Crimp sleeves sold separately and packaged individually by Owen Oil Tools. P/N DET-0010-074*

Caution: ***Owen Super Crimpers are designed to consistently create the proper crimping configuration! Use of any other crimping device could result in a misfire, caused by an inadequate crimp or damaging the detonator!***

The user should satisfy themselves, as to the suitability of this product for the user's application. Please refer to the Owen Oil Tool's "Technical Specifications" sheet (Owen Document # 2-300750-1-DS-01) for more information.

Green DET™ for Pipe Recovery Applications



The Green DET™ is compatible with all Owen's Split Shot® and Cutter (ACE, NT Segmented, etc.) products. For Owen Cutter products, the rubber retainer accessory (P/N DET-0100-113) must be used in order for the detonator to be properly installed into the cutter hardware. Please Section 2.0 for general installation and arming procedures using the Green DET™.

Note: *Please refer to the Owen User Manual specific to the pipe recovery system being used. This manual will contain more specific information and instructions regarding the pipe recovery system being used.*

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Caution: ***Do NOT crimp directly onto the Green DET™! The detonator is not designed to be directly crimped and will damage the detonator if performed!***

The user should satisfy themselves, as to the suitability of this product for the user's application. Please refer to Owen Oil Tool's "Technical Specifications" sheet (Owen Document # 2-300750-1-DS-02) for more information.

1.0 Procedures for Panel Setup and Firing Green DET™

1.1 Prior to arming or gun make up:

• Measure the voltage output from the panel with a digital blasters multi-meter at the cablehead, CCL, or Quick-Change. Verify a minimum of 300V DC output can be applied from the panel to the meter.

Note: *Mark the location of the needle on the voltage meter panel when 300V DC is applied to the multi-meter. This location will indicate that you are applying 300V DC to the gun string.*

1.2 Reset panel to safe mode.

1.3 Continue proper assembly of toolstring.

1.4 When ready to fire the gun or detonator downhole, increase the power to the firing circuit from 0V DC to the marked needle location that corresponds to 300V DC. The detonator will fire anywhere between 55V and 300V.

Note: *The user will not see any current being applied to the detonator when ramping up on the rheostat dial. However, the voltage should continue to ramp up until the detonator fires.*

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2.0 Arming

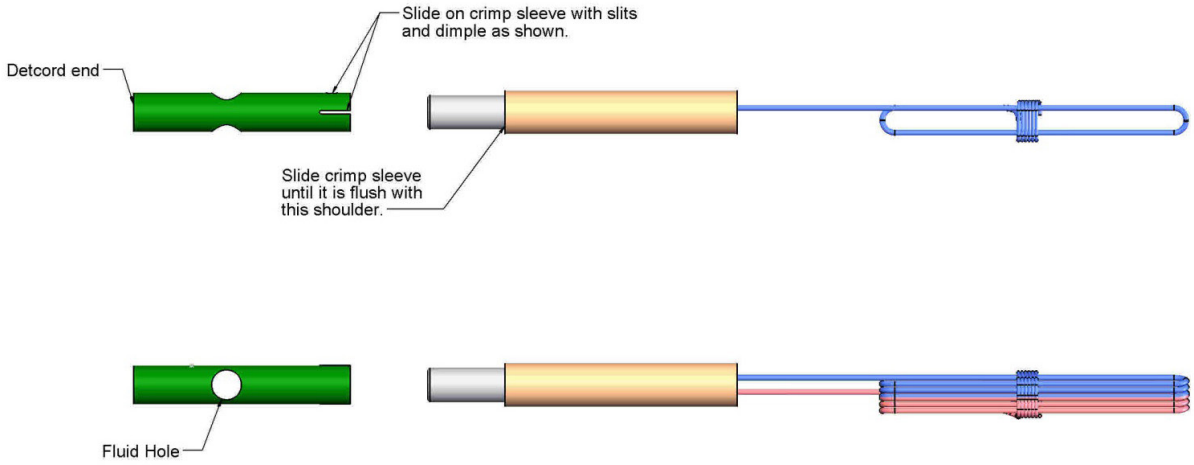
Warning: ***Detonators should only be removed from their storage and individual packaging in the loading/arming area at the time of arming! Always insert the detonator inside an Owen Detonator Safety Tube (Part # DET-2000-000) after removal from packaging and storage!***

Note: *An electrical check of the detonator's firing circuit may be conducted while the detonator is confined within a safety tube. Using electrical blasters multi-meter, the RF-Safe Green DET™ will measure between from 0.800 MΩ to 1.100 MΩ*

2.1 RF-Safe Detonator with Crimp Sleeve Accessory:

2.1.1 Remove both the Green DET™ (P/N 2-300750-1) and green, stainless steel crimp sleeve (P/N DET-0010-074) from their packaging. Keep the detonator shunted during handling.

2.1.2 Slide the green, stainless steel crimp sleeve onto the output end of the detonator making sure to slide the end with the slits onto the detonator. The figure below shows an example.


Slide on crimp sleeve with slits and dimple as shown.
Detcord end
Slide crimp sleeve until it is flush with this shoulder.
Fluid Hole

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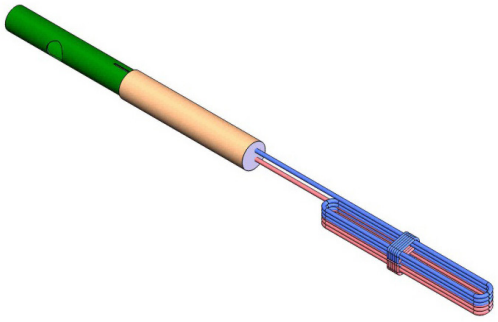
Make sure the crimp sleeve sits flush with the shoulder of the detonator. The crimp sleeve should be snug on the detonator. The finished product should look like this:

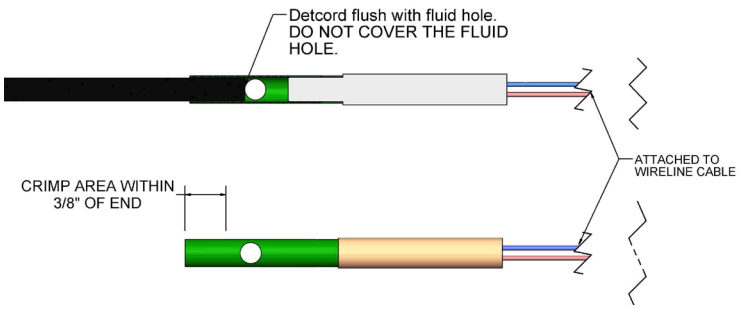


2.1.3 Insert the detonator into a detonator safety tube (P/N DET-2000-000) and secure the lid shut. The resistance may be checked at this time.

2.1.4 Make sure panel is safe, key is removed and outside the unit, and verify no voltage is measured on the wireline.

2.1.5 With the detonator still in the safety tube, electrically connect the detonator to the wireline cable by attaching the **red wire to hot lead and the blue wire to ground**. The detonator is now electrically armed, and it may now be removed from the safety tube.

2.1.6 Carefully make a square, clean cut of the detonating cord using the Owen Super Cutters (P/N DET-0000-036). Insert the newly cut end of the detonating cord into the open end of the crimp sleeve until it becomes flush with the fluid hole (see figure below). If using 40 gr/ft Ribbon detcord, then use Owen's detcord adapter (P/N DET-0010-006). The fluid hole should not be filled or covered by explosive powder, detonating cord, tape, etc. as this could prevent the detonator from being fluid disabled. Crimp the cord in place in a 3/8 in. (0.95cm) area from the end of the crimp sleeve using Owen Super Crimpers (P/N DET-0100-053). The detonator is now ballistically armed, and the finished product should look something like the figure below:



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2.1.7 Complete the mechanical assembly of the device and tool assembly taking care not to force, pinch, crush, or impact the explosive components or wiring. Be sure the green crimp sleeve is still attached properly and flush with the end of the detonator.

2.2 Green DET™ for Owen Split Shot®

2.2.1 Remove the Green DET™ from its packaging. Keep the detonator shunted during handling.

2.2.2 Insert the detonator into a detonator safety tube (P/N DET-2000-000) and secure the lid shut. The resistance may be checked at this time.

2.2.3 While keeping the detonator in the safety tube, insert the shunted wires of the detonator through the hole in the top sub.

2.2.4 Make sure the firing panel is safe, key is removed and outside the unit, and verify that no voltage is measured on the wireline.

2.2.5 With the detonator still in the safety tube, electrically connect the detonator to the wireline cable by attaching the **red wire to hot lead and the blue wire to ground**. The detonator is now electrically armed, and it may now be removed from the safety tube.

2.2.6 For all remaining steps, please refer to the Owen User Manual specific to the Split Shot system being used. This will contain specific information to the Split Shot and how to complete the ballistic arming procedure.

2.3 Green DET™ with Rubber Retainer Accessory for Owen Cutters

2.3.1 Remove the Green DET™ with rubber retainer accessory from its packaging. Keep the detonator shunted during handling.

2.3.2 Insert the detonator into a detonator safety tube (P/N DET-2000-000) and secure the lid shut. The resistance may be checked at this time.

2.3.3 While keeping the detonator in the safety tube, insert the shunted wires of the detonator through the male end of the shock sub extension mandrel.

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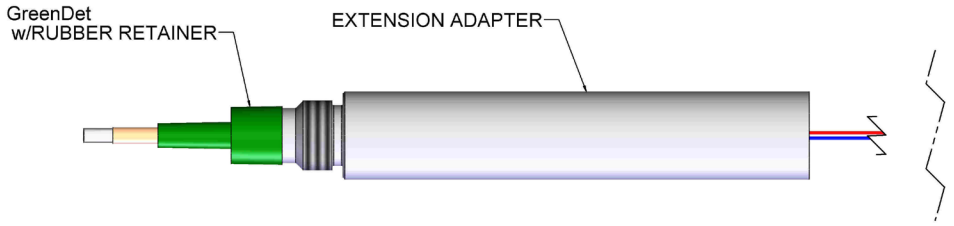
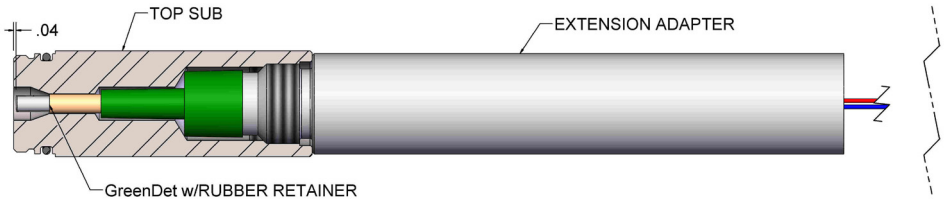
2.3.4 Make sure the firing panel is safe, key is removed and outside the unit, and verify that no voltage is measured on the wireline.

2.3.5 With the detonator still in the safety tube, electrically connect the detonator to the wireline cable by attaching the **red wire to hot lead and the blue wire to ground**. The detonator is now electrically armed, and it may now be removed from the safety tube.

2.3.6 With the detonator removed from the safety tube, install the booted portion of the detonator over the end of the extension adapter.



2.3.7 Insert the detonator, output end first, into the cutter top sub and thread the top sub onto the extension adapter. The detonator end should be roughly 0.040in. recessed from the bottom of the cutter top sub.



Note: *Top Subs and Extension Adapters will vary. Please refer to the Owen User Manual specific to the cutter system being used for more details on hardware and procedures.*

2.3.8 Make sure the top sub's o-ring is lightly lubricated with grease and thread the explosive cutter load/components onto the top sub being careful not to force, pinch, crush, or impact the explosive components. The ballistic arming is now complete.

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Note: *Please refer to Owen's Cutter User Manual specific to the cutter system being used. This manual will contain more specific information and instructions regarding the cutter assembly being used.*

3.0 Ballistic Transfer Interrupter

Warning: ***Owen's Ballistic Interrupter device is NOT compatible with any type of PETN based detonating cord! Due to PETN's sensitivity, it may still be able to pick up the shock from the detonator and initiate high order. In no circumstances should Owen's interrupt device be used and transported with PETN detonating cord. Please see compatible detonating cords in Section 3.1.***

3.1 Green DET™ with Crimp Sleeve Accessory:

3.1.1 When used with the green crimp sleeve, this detonator can use an Owen Interrupter to prevent ballistic transfer from the detonator to the detonating cord. With the interrupter in place, the detonating cord will not detonate. (Please see warning above). This feature may aid in the transport of an armed gun system following all applicable local and federal regulations. Please note this transportation is for the United States only and it is at the discretion of each company whether they choose to use this option.

3.1.2 The following detonating cord types are compatible with the Green DET™ with Crimp Sleeve Accessory (P/N DET-0010-074) and Owen Interrupter (P/N INT-3050-125I):

- 80gr./ft. RDX LS
- 80gr./ft. RDX LS
- 80gr./ft. RDX
- 80gr./ft. HMX LS
- 80gr./ft. HMX
- 40gr./ft. RDX LS
- 40gr./ft. RDX LS Ribbon
- 40gr./ft. HMX LS
- 40gr./ft. HMX LS Ribbon

Note: *Detcord adapters must be used with 40 gr./ft. Ribbon detonating cord. Sold separately and packaged individually by Owen Oil Tools. P/N DET-0010-006.*

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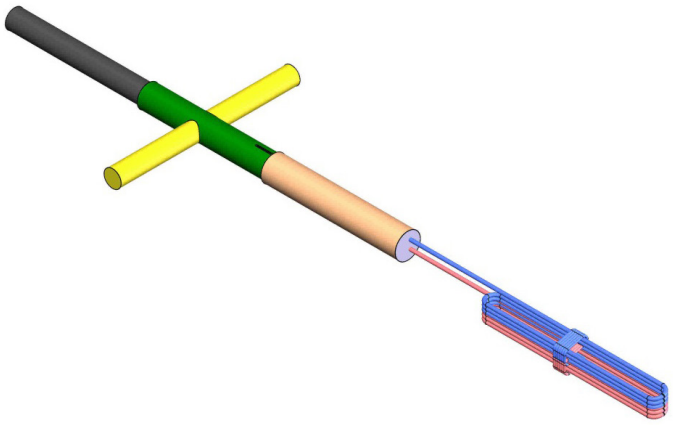
Warning: ***Do NOT use any other type of interrupter device other than Owen's INT-3050-125I! Extensive testing has been performed by Owen Oil Tools to ensure reliability and confidence when using this specific interrupter part.***

3.1.3 To interrupt the ballistic transfer, the interrupter device must be purchased from Owen Oil Tools, part # INT-3050-125I. Place the interrupter into the detonator crimp sleeve's fluid hole making sure that it is fully inserted with part of the interrupter sticking out of both sides of the crimp sleeve. The interrupter will fit snugly. The below figure shows the interrupter in place. The interrupter can also be removed through a sub port.



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